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CONTENTS.

	Page
The Thirty-first Long Fox Memorial Lecture: The Experimental Study of Development. By Professor C. M. Yonge, D.Sc.	49
Hospital Re-organization. By Somerville Hastings, M.S., F.R.C.S.	61
The Story of the Bristol Hospitals	66
Reviews of Books	71
Editorial Notes	73
Obituaries. Edward Fawcett, M.D. (Edin.), F.R.S.	77
Charles Arthur Wigan, M.D. (Dur.), M.R.C.S., L.R.C.P.	78
Elias George Hall, M.B. (Lond.), M.B., Ch.B. (Brist.), M.R.C.S., L.R.C.P.	79
The Medical Library of the University of Bristol	79
Publications Received	82
Local Medical Notes	82

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The Bristol Medico-Chirurgical Journal

"Scire est nescire, nisi id me Scire alius sciret."

AUTUMN, 1942.

THE THIRTY-FIRST LONG FOX MEMORIAL LECTURE:

BY

PROFESSOR C. M. YONGE, D.Sc.,

Professor of Zoology in the University of Bristol.

DELIVERED IN THE UNIVERSITY OF BRISTOL ON TUESDAY, 7th JULY, 1942,

ON

THE EXPERIMENTAL STUDY OF DEVELOPMENT.

THE problem of development—the manner in which an organism attains the size and elaboration of its adult structure—was not unnaturally a matter which early excited the interest of man. There exist, indeed, few more fascinating subjects than the change, over a period of hours, days, weeks, at most a few months, from the apparently simple structure of the fertilized egg to the immense structural and functional complexity of the insect, fish, bird or man into which it develops. Yet so commonplace is the fact of development that we tend to take for granted a process occupying days or weeks, while the occurrence of evolutionary processes over hundreds of millions of years remains a subject of dispute.

The foundations of the science of embryology, that branch of biology which deals with development, were laid by the Greeks. Amongst the Hippocratic writings there are many allusions to development, although mainly in connexion with obstetrical and gynæcological problems. But even at this early date, in the fourth century B.C., there are attempts at causal explanations and the important fact was noted that the embryo "dries up," *i.e.* loses water

during development. But it is from Aristotle, the first great biologist, in some respects the greatest of all biologists, that the bulk of classical knowledge on development comes. His work on *The Generation of Animals* is the first text-book on embryology, beyond which little further advance was made until modern times. Yet, in the absence of the essential aids of microscope and microtome, the more fundamental facts inevitably escaped him. Thus, although he distinguished between oviparity, ovo-viviparity and viviparity, described later stages in development and allotted the correct functions to the placenta and the umbilical cord in the mammals, he knew nothing of the essential nature of the egg and the spermatozoon. Adopting what appears to have been an Egyptian view, he regarded the human embryo as arising from the menstrual blood under the moulding and dynamic agency of the male secretions, although he admitted the possibility of the operation of some previously existing mechanism which was thus set in motion. In one important matter he anticipated modern views. The Hippocratic belief was that development was no more than a revelation of previously existing complexity, *i.e.* essentially merely an increase in size, a belief later known as preformation: but Aristotle concluded that development represents an ever-increasing degree of complexity of structure; he was an upholder of the opposing view of epigenesis.

Galen, the great physician of the Roman world, made comparatively minor contributions to embryology and we have to await the revival of the spirit of scientific enquiry at the Renaissance for further significant advance. Leonardo da Vinci, one of the supreme minds of all times, left in his amazing note-books beautiful drawings of the human fœtus in utero, but, more significant of the new age of which he was the precursor, he made measurements of embryos at various stages and, by his mathematical analysis of the processes of development and growth, has claims to being considered the first experimental embryologist. William Harvey, whose fame as an embryologist has been overshadowed by his still greater fame as discoverer of the circulation of the blood, maintained in his great work on *The Generation of Animals* that "all animals are in some sort produced from eggs" wherein "no part of the future organism exists *de facto*, but all parts lie here *in potentia*."

Here was a clear statement of embryological fact and from such a beginning, with the help of the recently-discovered microscope, rapid progress might have been expected. But, most unfortunately, a controversy developed which impeded progress for more than a century. Malpighi, the first great histologist, made microscopical examination of the developing egg of the hen, but did so in the heat of the Italian summer when development may proceed without incubation. Hence he found, in what he took to be the undeveloped egg, clear traces of the future adult and so claimed to have demonstrated the fact of preformation which Harvey had

denied. About the same time the Dutch microscopist, Leeuwenhoek, identified spermatozoa from the seminal fluid and, seeing faint indications of internal structure, claimed that they were miniatures of the adult. Thus there arose two schools amongst the preformationists; the ovists who proclaimed that the adult structure was present in the egg and the animalculists who claimed that it resided within the sperm. And until the end of the eighteenth century the history of embryology is largely the record of the wordy battles between the upholders of these views and between them and the supporters of epigenesis. Such progress as was made concerned such matters as the identification of the ovaries and the testes.

The light of scientific truth re-emerges in 1759 with the publication by Caspar Friedrich Wolff of his *Theoria Generationis*, in which he stated that the parts of the embryo of the chick appeared in turn and could be *seen being formed*. His work leads directly to that of the greatest of embryologists, the Esthonian, Karl Ernst von Baer, whose work in descriptive and comparative embryology brings us almost to modern times; he died at a great age in 1876. Meanwhile Spallazani, the pioneer experimental zoologist of the eighteenth century, had shown that sperms were essential to development. But it was not until the middle of the last century that the union of the egg and the sperm was observed and still later before it was realized that this involved the union of the nuclei. From this discovery, in turn, there dates the beginning of those investigations which have culminated in the discovery, first of the chromosomes within the nucleus, and then of the genes borne upon these which, linking up with Mendel's experimental study of inheritance, have been revealed as the controlling agencies in heredity.

To revert to the descriptive work of von Baer and his followers in the nineteenth century. It was shown that the developmental history of any animal was an orderly series of stages, beginning with the fertilized egg which divided repeatedly to form typically a hollow sphere known as the blastula, which by intucking of the cells on one side, or overgrowth by the future outer cells, if the former process was mechanically impossible, produced a two-layered stage, the gastrula. The outer layer of cells became known as the ectoderm, and gave rise to the skin, nervous system and sense organs; the inner, which formed the future gut, as the endoderm. With the formation of the gastrula the first indications of the future organs—in the vertebrates the nervous system and the primitive axial skeleton or notochord—made their appearance. Between the two primary cell layers was introduced an intermediate mesoderm layer from which were derived in development the body cavity, the remainder of the skeleton, and the muscular, circulatory, excretory and reproductive systems. After this initial blocking

out in the rough of the future organs there followed a period of tissue differentiation, at the conclusion of which the developing organism became a functional individual.

The development of great numbers of animals, both vertebrates and invertebrates, was studied in detail during the latter half of the last century and a most imposing mass of knowledge acquired, much of it in connection with the study of evolutionary processes initiated by Darwin who had published his *Origin of Species* in 1859.

But in any science description is only the first stage ; it is the prelude to analysis by measurement and experiment. The distinguished American embryologist, Professor F. G. Conklin, who played a notable part in the initiation of the experimental period in embryology summarized development as a series of responses to stimuli, the responses being not merely repetitive as in the case of the tissue cells. He likened the egg to a complex machine so constructed that it transforms itself at every critical stage into another machine with its own peculiar mode of action. The problems to be solved concerned the nature of the mechanisms within this continually changing machine.

Fertilization of the egg became recognized as a dual process, one of activation, *i.e.* the initiation of cleavage, and the other consisting of the union of the male and female nuclei, from the sperm and egg respectively. The latter process ensured the passage into the new organism, so initiated, of hereditary material from two sources, but, although in the majority of cases entrance of the sperm is also necessary for activation, important exceptions reveal that the egg can develop without the presence of the sperm. In representatives of various groups of animals, notably in the Insecta and Crustacea, eggs frequently develop parthenogenetically, *i.e.* without the assistance of the males which may be absent during certain periods of the life-history (in a few cases no males have been found at any stage). Normally, however, a series of parthenogenetic generations is followed by one in which males appear. In other groups, notably the Echinodermata, artificial activation is possible. Jacques Loeb, one of the greatest of Jewish emigrants from Germany to the United States, showed how the eggs of starfish can be stimulated to develop by treatment, causing first a temporary increase in the permeability of the egg, followed by the removal of some of the water from within it. As a result of activation the potentialities of the quiescent egg cell are dramatically converted into kinetic energy, revealed in some cases by an immediate great increase in oxygen consumption, but invariably by the subsequent initiation of the process of cleavage.

A problem which early presented itself in this period of experimental analysis was the fate of the individual cells into which the single activated egg cell gave rise in early cleavage. Did cleavage, it was asked, divide the egg into portions corresponding to the parts

of the future embyro, *i.e.* were definite organ-forming substances present in different parts of the egg and so became separated from one another when the egg divided ? Experiments were carried out in which the early cleavage products, or blastomes, were separated from one another and their subsequent fate followed. These revealed that eggs could be divided into two types. There were *mosaic* eggs in which any portion of the products of early cleavage formed only that portion of the embyro which it would have formed had it remained in contact with the other product or products of egg division. But there were other, so-called *regulative*, eggs in which separated blastomeres formed complete but small embryos. Partial separation of the blastomeres produced double monsters ; the union of two activated eggs led to the formation of an unusally large, but single, embyro. Thus in eggs of this type, which included those of the Echinodermata and, to a more limited extent, of the Amphibia, the early stages of development are plastic ; the greater part, though not actually all, of the egg has no predestined fate. But invariably this plastic stage is succeeded by a mosaic stage in which the fate of the various parts is determined. This comes, in the case of the Amphibia, at about mid-gastrulation. And it is upon amphibian development that much of the significant work of the past twenty years has been done.

The amphibian egg is not homogeneous. It is rich in yolk, but the greater part of this collects at one end, the so-called " vegetative " pole, the bulk of the protoplasm with the nucleus lying near the opposite " animal " pole. It was discovered at a relatively early stage in embryological investigation that, although before fertilization the egg is apparently radially symmetrical about an axis which passes from the animal to the vegetative pole, bilateral symmetry appears immediately after fertilization. The animal pole is dark in colour, the vegetative pole light, but between the two after the entrance of the sperm there extends a grey crescent. The position of this has been regarded as controlled by the position of entrance of the sperm because it usually appears exactly opposite to this ; but there is some doubt on this point. What is certain, however, is that from this stage onwards the orientation of the developing egg and so of the future embyro and adult is determined. The widest area of the grey crescent is mid-dorsal and the egg is now bilaterally symmetrical about a plane passing through the middle of the crescent and the two poles. The first division of the egg is normally in this plane. The result of later cleavage is to bring about the formation of a hollow blastula composed of many small cells on one side, derivatives of the micromeres from the animal pole and, on the other, of larger cells from the yolk-laden macromeres of the vegetable pole.

The fate of the cells of the blastula has been followed out by the ingenious method of staining them in life with harmless dyes such

as neutral red or Nile blue. In this way the superficial cells at this stage in the developing amphibian—frog or newt—have been mapped out into "presumptive" areas. The term presumptive is important. It implies that, under normal developmental conditions, these areas will develop into certain specified structures, *e.g.* endoderm, mesoderm, notochord, neural plate, or epidermis. But actually most are still fundamentally undetermined and, as we shall see, under certain experimental conditions, or as a result of damage, their fate may be changed. Of one region only is the destiny irrevocably determined at this stage and that is the area occupied by the cells of the grey crescent.

The extraordinary significance of this region was discovered by the late Professor H. Spemann, who was subsequently awarded the Nobel Prize for his work. He developed a very beautiful technique whereby he was able to excise portions of these early embryos and graft them into other embryos. Carefully executed experiments and critical analysis of the results obtained led him to one of the really significant advances in the experimental analysis of development.

Spemann used the embryos of newts, which provide better experimental material than those of frogs. When the gastrula is formed—by a combination of overgrowth and inpushing in the amphibia — the opening of the new internal cavity, lined by endoderm, constitutes the blastopore. In animals where little yolk is present in the egg this represents a rounded opening, but in the amphibia, where the egg is yolky, this is blocked by a plug of yolk-laden cells. The blastopore comes to lie on the posterior side of the embryo and from its upper, dorsal margin there extends forward the shallow medullary groove which later forms the neural tube. From this, by subsequent specialization of the cells, is formed the central nervous system characteristic of all vertebrates. Spemann removed the upper lip of the blastopore from one embryo and grafted this into the side of another embryo at the same stage in development and established the remarkable fact that in front of the grafted cells there appeared a medullary groove in addition to the one which appeared in the normal position. Meanwhile in the original embryo from which the dorsal lip had been removed no medullary groove appeared. He further showed that these results could only be obtained if the tissue was removed and the graft established in young gastrulæ. Later removal did not affect the subsequent appearance of the medullary groove and grafting had no effect. At the same time the experiment had not to be carried out too soon or no effect was produced by the grafted cells.

These results were explained by Spemann by postulating the presence of an "organizer" in the dorsal lip of the blastopore, the presence of which induced the formation of the medullary groove. An invisible, chemical change in the cells preceded the visible

structural differentiation, so that if the dorsal lip was removed after a certain stage in development the medullary groove would still appear. In the same way the cells of the embryo into which the excised dorsal lip was grafted had to be "competent"; if the graft was made too late the fate of these cells, which would normally develop into skin, had been determined and the organizer could not therefore induce the formation of an additional medullary groove.

Later work, some of it in this country, notably by Needham and Waddington, has abundantly confirmed these results. An organizer or "organization centre" has been located in the embryos of other amphibia and other groups of vertebrates, such as mammals, birds and fishes, but also in the embryos of invertebrates such as echinoderms and insects. It was early shown that induction of the formation of a medullary groove would take place, not only after the cells had been narcotized but also that the organizing substance, or evocator, as it is now frequently termed, persists after the death of the cells containing it. It is resistant to heat, to freezing and to the action of a wide range of organic substances; indeed it is only destroyed when the cells are reduced to ash. That a chemical substance is involved is indicated by the fact that small pieces of agar after being placed in contact with the dorsal lip of the blastopore for a short time acquire the power of inducing a medullary groove when applied to other embryos, indicating that some specific substance had diffused into the agar from the cells of the original embryo. A variety of artificial evocators such as methylene blue, sterols and fatty acids have a similar effect, and it is probable that they produce their effect by causing the cells of the embryo to release the normal evocating substance. Attempts to isolate the chemical substance, or substances, involved have not, as yet, been completely successful. In view of the minute quantities concerned this is not surprising. But the evocator does appear to be soluble in ether and petrol-ether and it may be one of the sterols. If this is the case, then it belongs to the same group of substances as certain of the sex hormones and cancer-producing agents. All of these, it will be noted, are in some way or other concerned with development or growth—normal or pathological.

The organizer is not specific; cells from the primary organization centre of the embryo of one group of animals, for instance birds, will induce the formation of a medullary groove in the embryos of another, such as amphibia. But there is something inherent within the cells of the particular embryo which insures that it is amphibian tissues which are induced by the evocator and not avian. It may be assumed that it is the genes resident on the chromosomes which are responsible for the particular reactions of the cells—the stimulating substance being identical in all cases. There is certainly a most complex interplay between the stimulating evocator and the reacting cells, the analysis of which will involve much further work.

There is evidence that the pattern which the induced tissues assume is influenced both by the evocator and the tissues affected.

The position of the primary organization centre was determined, as we have seen, at fertilization. It invariably appears within the region of the grey crescent. The actual position of this would seem to be determined by what, in our present state of knowledge, we can only describe as the interaction of certain gradients within the egg. There is a gradient from the vegetative pole to the animal pole and apparently at right angles to this a second gradient, the organization centre appearing at the intersection of the two.

Although the medullary groove, the first indication of the future central nervous system, is the first organ rudiment to be *induced* it is actually not the first to be *formed*. Beneath it, along the upper side of the archenteric, or primitive gut, cavity which is formed at gastrulation by the intucking of the cells around the blastopore, two other organ rudiments make their appearance. These are the notochord, the primitive axial skeleton of the vertebrates, and the segmented mesodermal somites which give rise to the body cavity, body musculature, excretory system and so forth. The notochord is situated in the antero-posterior axis of the embryo, the mesodermal somites appearing bilaterally on either side of this. These structures arise spontaneously at a certain critical stage in development, namely mid-gastrulation, and it is their presence which induces the appearance of the medullary groove above them. The dorsal lip of the blastopore actually consists of cells which will, by the continual process of intucking, form notochord and mesoderm.

This induction can be proved in two ways. First by grafting early notochordal and mesodermal cells below "competent" ectoderm, following which a medullary plate invariably makes its appearance above the region of the graft. Second by rearing suitably susceptible embryos in dilute saline solutions. This treatment has the effect on converting the normal gastrulation invagination into an evagination, *i.e.* the cells which form the primitive gut, notochord and mesoderm are pushed out away from the rest of the embryo instead of being tucked in under the superficial ectoderm. Under these conditions a notochord and mesodermal plates lateral to this appear within the mass of cells which has been pushed out, but no medullary plate is formed along the mid-dorsal line of the ectoderm because there is no chorda-mesoderm below it and so no inductive action. We speak, therefore, of the *self-differentiation* of the chorda-mesoderm and of the *induction* of the medullary plate which normally appears above it.

The result of the appearance of the chorda-mesoderm and of the inductions which this primary organization centre brings about is thus the formation of a zone of constructive activity along the antero-posterior axis of the embryo. This has become known as the primary organ field. This conception of fields of dynamic

activity is at present no more than a description of what we observe and is in no way an explanation, although there are many indications that some underlying physical mechanism will eventually be disclosed. The primary organ field gives rise to a series of secondary organ fields or sub-fields which control the development of the notochord along the mid-line and of the first-formed mesodermal structures which produce body cavity, excretory and muscular systems on either side of this. It also, by way of the medullary plate, induces the formation of the sub-fields concerned with the formation of the nose, the ear and the eye, anterior to and lateral to the brain region.

In this way the embryo becomes a mosaic of different fields, each a centre of dynamic energy and concerned with the development of some particular organ system, eye, ear, heart, limbs, tail and so forth. This establishment of local control in different areas of the developing embryo is spoken of as *emancipation*, indicating some measure of freedom in these various areas, although all work together for the eventual formation of the unified organism. The, as yet, unspecialized embryonic cells provide the material on which the dynamic energy of the various fields exerts its effect. It does not appear unreasonable to postulate a competition between the activity of the various fields of activity, but there is no compromise; cells lying between two such fields must come completely under the domination of one or the other; once they have done so there is no turning back, they are inevitably committed to the formation of a particular organ, eye or ear or limb as the case may be. Meantime the original unitary primary field persists especially in connexion with the direction of the primary axis of growth and of the various subsidiary organ fields.

It will be profitable at this stage to consider briefly a few examples of these secondary fields and of their mode of operation. The classic case is that of the eye which will be dealt with first. It has long been known that the vertebrate eye has a dual origin. After the primitive brain has made its appearance, there develop on either side of the fore-brain a pair of projections known as the optic vesicles, which grow outwards towards the side of the head. Gradually each assumes the form of a hollow bulb attached by a stalk. The latter gives rise to the optic nerve, the former to the eye itself. The outer wall becomes pushed in against the inner wall so forming the optic cup, the outer cells of which eventually constitute the retina. But at the same time the superficial ectodermal cells nearest to the centre of the optic cup thicken, project down into the opening of the cup and then separate from the superficial ectoderm to form the rudiment of the future lens. The completed eye, therefore, represents the intimate functional association of material from two sources.

Here is an organ rudiment admirably suited for experimental

treatment and experimental embryologists have been quick to avail themselves of the opportunity. In the Amphibia the results obtained have varied according to the species studied. In the grass frog, *Rana fusca*, if the eye rudiment is removed not only does no optic vesicle appear but also no lens, although the cells which normally form this are uninjured. This indicates that the optic vesicle induces the formation of the lens and this conclusion is confirmed by the results of experiments involving the removal of the optic rudiment and its transplantation under the ectoderm of the body, when a lens appears, for instance, in the middle of the under side of the body. In the same way if the ectoderm which normally overlies the optic vesicle is removed and replaced by grafted cells from other parts of the body a lens is formed. In other words there is, in this species, nothing inherent in the ectoderm which brings about the formation of a lens; this is induced by the specific organizing action of the cells which form the optic vesicle. On the other hand in the allied edible frog, *Rana esculenta*, or in the axolotl, the lens does appear even after the removal of the vesicle below it, while grafting of the eye rudiment into other regions of the body does not induce the appearance of a lens in those regions. Other examples could be quoted where conditions are intermediate between these two extremes, and the explanation of the differences, although the evidence is not yet complete, appears to reside in the time at which chemical, as apart from structural, differentiation of the ectodermal cells occurs in different species. Once this has occurred there is no going back; lens formation of certain cells, skin formation by other cells is from that moment irrevocably determined.

In the same way the formation of the capsule of skeletal material which surrounds the ear does not occur if the rudiment of the ear vesicle is extirpated in the early embryo. That the capsule is formed as a result of inductive action is proved by its formation in unusual regions of the embryo into which the rudiment of the ear vesicle have been transplanted.

Although each organ field is normally an entity it may combine with another of the same type, or, on the other hand, if a particular organ rudiment is divided it may give rise to two or more similar structures instead of the usual one. A few examples will make these points clear. If an eye rudiment in a sufficiently early stage is transplanted close to another at about the same stage in development, due attention being paid to the orientation of the graft, the two organ fields will fuse with the consequent formation of a single, although rather large, eye. Such a fusion of separate fields would appear to occur in the normal development of the vertebrate heart. This organ arises in the trunk region from the mesodermal plates on either side of the mid-line ventrally. The rudiments grow together and eventually form a single tubular structure which divides up into the four primitive chambers, which early begin those rhythmical

pulsations which will be continued throughout the life of the animal. It is now some three hundred years ago since Harvey spoke of the "capering bloody point" of the embryonic heart. If the early heart rudiments are transplanted a four-chambered pulsating heart may be formed in altogether abnormal parts of the body. But if the mesodermal rudiments from the two sides are prevented from growing together, by the introduction between them of foreign tissue or the cutting of a wide incision, then each will proceed to form a separate heart with, in due course, circulatory powers. Thus both in normal development and as a result of experimental grafting two like centres of developmental activity may blend with the resultant formation of a single structure.

Subdivision of organ fields has been brought about in many instances. With the heart, the two original components may be kept separate and each subdivided with the consequent formation of as many as five hearts in a single embryo. Limb rudiments may be split and twin limbs produced. It is probable that abnormalities in development which cause separation of organ rudiments are responsible for the birth of animals with additional limbs, eyes and even, on occasion, heads.

It is only possible to consider one further point which emerges from the experimental analysis of limb formation. This is controlled by a bud of mesodermal cells which contain the specific organizing field, the outer, ectodermal, cells merely conforming to the growth pattern assumed by these underlying cells. Transplantations of these mesodermal buds beneath the ectoderm elsewhere and the consequent formation there of a limb proves this. But in the case of the limb we are dealing with an organ having considerable extension in length and which demonstrates very beautifully that gradient in activity to which reference was made earlier. If the limb of a newt is amputated at the base, the wound heals and then, after a few weeks, a mass of cells accumulates under the epidermal covering. This cell mass, or blastema, grows and gradually assumes the form of a limb with all the internal equipment of bones and muscles and surrounded by skin. Into this new limb penetrate blood vessels and nerves to nourish and control it.

Now if the limb be severed in the region of the forearm and then the humerus be removed from the portion which is left, the blastema which subsequently appears is able to regenerate the lower half of the limb including the digits, but is incapable of forming a new humerus behind the cut. This surely indicates the presence of a field of activity possessing a gradient of activity from the base outwards. Regeneration from the base produces a complete new limb; regeneration from an intermediate position along the limb produces only the distal portion, even although constituents from the more proximal regions have been removed, because only a part of the organ field is concerned. There is much in the facts of

regeneration amongst the simpler invertebrates which supports this theory of gradients in activity, which was originally developed by Professor C. M. Child as a result of work on regeneration which largely preceded modern developments in experimental embryology. Regeneration essentially represents embryonic development during adult life and the incorporation of its study within the sphere of experimental embryology has led to an enrichment of the content of that branch of zoology.

It is impossible to proceed further with this subject and to discuss the specialization of cells to form tissues and the later appearance of functional organs. Here both the organ field and the interaction of tissues play their part, while functional activity itself finally assumes some control over maintenance or "conservation" of fully constituted organs or tissues. But despite the heterogeneous nature of the adult structure produced by this mosaic of developmental fields, there is finally produced that unit in function and behaviour which we designate an organism.

In this brief survey of recent developments in experimental embryology an attempt has been made to indicate the range and far-reaching significance of modern investigations. Embryology, which at the beginning of the century was little more than descriptive repetition, has now become one of the most active branches of zoology. Modern work has, in some measure, reconciled the old conflict between Preformation and Epigenisis. There is an underlying preformation, although not of the type postulated by the old Preformationists, but development itself is epigenetic representing a progressive increase in complexity from egg to adult. The experimental analysis of development is one of the most hopeful approaches to that fuller interpretation of living things and living processes which is the essential aim of the science of zoology. In that way it is adding to the basic raw material of knowledge which the art and science of medicine applies to the amelioration of human suffering and the promotion of the health and happiness of mankind.

HOSPITAL RE-ORGANIZATION.*

BY

SOMERVILLE HASTINGS, M.S., F.R.C.S.,

Surgeon-in-charge, Ear, Nose and Throat Department, Middlesex Hospital, London ; Chairman of Hospitals and Medical Services Committee, L.C.C.

WHILST it is true that many new hospital wards have been built during the war, it is also unfortunately correct that many have been destroyed. It is, of course, difficult to look ahead, but it seems likely that hospitals will be even more necessary after the war than they were before. It may be that people will be poorer ; it is certain that there will be a severe housing shortage for many years and, therefore, a greater need for institutional accommodation. Further, treatment, particularly surgical, for conditions that do not cause immediate incapacity, has, in many cases, been postponed during the war. In addition to this, there are war injuries which may be very numerous before victory is won. And lastly, there is the fact that medicine of late years has tended to become more and more mechanized as well as specialized, and this implies an increasing need for hospital accommodation. How is this need to be met after the war ?

Most people will, I think, be agreed that it will not be economical or efficient to have two systems of hospital administration—the municipal and the voluntary—doing the same sort of work, and more or less in competition with one another ; just as it could never be permissible to have two separate armies with no relation to one another trying to fight a common enemy in the same area.

I should be the last to endeavour to decry the splendid work done in the past, as indeed to-day, by many voluntary hospitals, but the fact remains that the voluntary system has failed to deliver the goods, or in other words to respond to the public need, and because of this municipal hospitals have been developed, and now provide nearly three times as many beds as the voluntary.

Before discussing the development of hospitals in the future, it may be of service to consider what is the ideal system—what, indeed, we must keep before us as an ultimate aim even when we are carrying out the first steps in re-organization. The hospitals of the future

* Notes of a lecture given on 14th June, 1942, at a meeting of the Bristol Branch of the Socialist Medical Association.

will have to be linked up, much more than they are to-day, with all the other preventive and curative agencies. The area of administration, I think, will also have to be large—larger, in fact, than most, if not all, the present Local Authority areas, and should consist probably of not less than a million people. In London, in connection with the municipal hospitals, we have been able to learn from personal experience a good many of the advantages of a large area of administration. Here the seventy-four general and special hospitals are under the charge of a single Medical Officer of Health, and a single Committee for administration, with, of course, the assistance of many sub-committees, both central and local. One great advantage of a large unit is the possibility of bulk purchase of supplies, and here not only is money saved, but quality is maintained, for no firm will be prepared to offend a large customer if this can possibly be avoided. Then there is standardization of equipment and supplies. This, of course, has its dangers, but after careful trial of various types of bedstead, syringe, or other article, at hospitals of different kinds, a standard pattern may be evolved which has many obvious advantages. Then there is the economy of beds because of the possibility of transfer of cases and change of user of any hospital, and much the same applies to medical staff. A few years ago there was a sudden epidemic of influenza in London. The municipal general hospitals were full, the voluntaries could not—or would not—take such cases. Fortunately, however, the incidence of infections disease was low, and within a few days many hundreds of influenza cases were taken into wards especially cleared for them in fever hospitals, and fortunately no cases of cross infection occurred. But perhaps the greatest value to both patients and staff is the possibility of specialization in a large unit. In the London municipal hospitals all plastic cases go to one hospital, nearly all thyroids to another, those needing chest operation to a third, and those requiring radium treatment to one of two. In this way specialized treatment both by doctors and nurses is obtainable, and not only do patients consequently benefit, but the possibilities of valuable research work are greatly increased.

A large hospital area is, therefore, the first essential, and since the consumers, that is the patients, must always come first, and since the final decision on any important point must always be left in their hands, I feel it is necessary that the hospitals in this area should be controlled by a popularly elected Council or Committee. It may, of course, be that a Health Board may first have to be constituted from existing Local Authorities, but eventually the Council in control of this large area should be popularly elected, and should deal, in my opinion, not only with health matters but also with education and most of the other functions now dealt with by Local Government Authorities. I feel sure that all will agree that on such a Board or Council there should be room for co-opted

persons, both medical and lay, who have knowledge and experience to put at the service of their fellows. No doubt such a body would divide itself up into various sub-committees, *e.g.* one for domiciliary medical treatment by, I hope, full-time general practitioners and consultants, and another for hospital administration.

Besides dividing up the country in this way into a dozen or more large regions for administration purposes, it will often be convenient for each region to be sub-divided into local units or divisions, the most convenient being one of approximately 100,000 people, and consisting of a small town and the surrounding district. I would not make this a hard and fast rule, and in not a few cases the unit may have to be much larger, but there are many advantages in having such local units in which most of the doctors and other health workers know one another and appreciate each others work. The ideal hospital for such a unit of 100,000 people is one of about a thousand beds, situated, as far as possible, somewhere near the traffic centre of the unit. This hospital should take in all cases that are not dangerous to others, that is to say, everything except tuberculosis, infectious disease and declared mental disease. The rarer specialties, however, might usefully be dealt with each at a single general hospital in the region, as is being done in London. The hospital's services should either be free, or provided by some form of insurance, so that there can be no question of immediate payment by the recipients for these services. The staff should be whole-time, and many of the senior whole-time physicians and surgeons will also see patients in consultation with the general practitioners of the service, either at the Health Centres where the G.P.'s would do much of their work, or in the patient's homes.

It is desirable, I think, that the senior clinical posts in such a hospital should be at least equal in both status and salary with the administrative. Further, I think it is important that every grade, medical and lay, represented in the hospital service, should have, through their appropriate organization, the possibility of direct approach to the Committee of Management for both requests and suggestions.

Lastly, it may be useful to consider how best we can pass by gradual stages from the present hospital arrangements to the unified service which I have tried to sketch.

At the beginning of the war the Government took control of nearly all hospitals under the E.M.S. scheme, and has since paid for beds in these hospitals reserved for casualties and other E.M.S. cases whether occupied or unoccupied. In London, although there were three times as many municipal hospital beds in this service as voluntary, the officers-in-charge of the ten sectors were drawn entirely from the staffs of the voluntary hospitals.

A case could be made for the continuation and extension of the E.M.S. hospital service after the war. It has certainly provided regionalization and some specialization, too, for hospitals for cranial surgery and some other specialities have been developed, but those who have been in close contact with the working of the scheme cannot have failed to have seen the many disadvantages of the divided control in it. There are, however, even more serious disadvantages which make, in my opinion, a continuation of this system after the war impossible. In the first place, it is entirely undemocratic ; it is controlled by the Ministry of Health, and the Ministry of Health Vote comes up on one day per year in Parliament, on which day it is only possible for a very few members to make short speeches and voice grievances. There has been very little planning about the hurriedly conceived E.M.S. scheme. Many Local Authorities which have put much money and energy into the development of their municipal hospitals would greatly resent their being taken over for all time by the Government ; nor, indeed, would it be easy for a hospital system for the whole country to be run from Whitehall. The voluntary hospitals have done exceedingly well from the E.M.S. ; they have received large sums for treatment, or for keeping their beds unoccupied. If the Government were to offer them reasonable payments they would probably refuse, as they have a perfect right to do as private organizations. If the Government were forcibly to take them over, such a course could only be justified if all other private property were similarly nationalized. What should be done, therefore ?

First, I think all hospitals should be inspected and licensed, and except in an emergency only allowed to undertake work for which they have an efficient staff and equipment.

Next, it should be made the statutory duty of the major Local Authorities to provide efficient hospital treatment for all who need it in their area of administration.

In endeavouring to carry out this it would be absurd to ignore the existence of the voluntary hospitals that provided nearly a third of the hospital beds before the war. Clearly, therefore, the Local Authorities must come to terms with these hospitals, and in cases in which there is not sufficient accommodation to provide treatment for all that need it in their own municipal hospitals, they must pay either part or the whole of the cost of treatment of cases that they are compelled to send on to the voluntary hospitals. In return for this the voluntary hospitals must agree that conditions of admission to hospital, as well as of staffing, are similar in all the hospitals of the region, and also that the Local Authorities are given representation on the Boards of Management of the voluntary hospitals proportionate to the amount of money that they provide for their maintenance.

This is, in essence, the scheme which was proposed in Parliament

by the Minister of Health on 9th October, 1941. But he went a step further, and very rightly. He said that not only is all this necessary, but that there must also be inspection of hospitals and the formation of a plan so that the resources of each hospital may be estimated and each hospital given its right place in a scheme for the hospital needs of the region. Already the plan for the London area is well advanced and two capable doctors are spending most of their time in working this out. It will then be put before all the hospital authorities concerned, and when the necessary adjustments are made, it will become the plan for London. Strong pressure will be made by the Ministry of Health to induce all hospitals to conform to this plan, and penalties such as the withdrawal of grants for services provided, or refusal to rebuild or extend under a Town Planning Scheme, may be imposed where necessary.

As soon as a scheme of this nature is in good running order it should be possible for the Government to make all hospital treatment provided through the municipality free by Act of Parliament. In that case, anyone requiring treatment and desiring it in any hospital, municipal or voluntary, would be able to obtain it for nothing by application through the municipality. It is difficult to imagine that in these circumstances anyone would apply to the voluntary hospital direct. The voluntary hospitals would thus be filled almost completely by municipal patients, and would thereby pass automatically to the control of the municipal authorities, and for the first time there would be developed a really national hospital system.

THE STORY OF THE BRISTOL HOSPITALS.

THE following account of the Bristol Hospitals during the 1940–41 series of air raids, is reprinted from *Bristol Under Blitz* (Arrowsmith, 2s. 6d. net), by permission of the author, Alderman T. H. J. Underdown, and the Lord Mayor's War Services Council. Some account of the hospital experiences during blitzes would have appeared before in the *Journal* but for censorship restriction. Now that these have been relaxed for Alderman Underdown's book, we welcome the opportunity of giving the story in the words of the first official account of Bristol's Air Raids, and express our thanks to the Author, the War Services Council and the publishers.

Bristol is well served by an efficient Hospital system. The largest voluntary Hospitals are the Royal Infirmary, the General Hospital and the Children's Hospital, with the Cossham Memorial Hospital in the Kingswood area. The Southmead Hospital was established and is maintained by the Health Department of the City Corporation.* Winford Orthopædic Hospital is situated in Somerset, about five miles south of the City. Specialist treatment is given at the Homœopathic and Eye Hospitals. The Ham Green Hospital and Sanatorium, also in the County of Somerset, is used by the City Corporation for isolation cases. All these institutions rendered conspicuous service for those severely injured through enemy action.

Civilians treated in the Hospitals and listed as seriously injured included many men, women and children. To these were added men of the Services who met with serious injury whilst in discharge of their duties. A glimpse at a few incidents which occurred at these institutions gives some inkling of the stress and strain borne by the staffs during the period of the major raids upon this City.

The Bristol General Hospital suffered much damage, but not a single patient nor a member of the staff was seriously injured, which was a great consolation considering the damage sustained by the building. During the period of heavy attacks upon the City many high explosive bombs were dropped in close proximity to the Hospital, shattering windows and blowing the doors to pieces. On 2nd December

* EDITOR'S NOTE.—Southmead Hospital has actually a far longer history. In 1696 the Bristol Corporation of the Poor established St. Peter's Hospital in the old Mint. This hospital outgrew its premises and underwent several removals without any break in the continuity of its service. In 1915 the Guardians of the Poor had just completed the building of a new hospital at Southmead. This was occupied as a Military Hospital until 1919, when it was handed back to the Guardians and opened as a Poor Law hospital. Under the 1929 Act the hospital passed into the management of the Health Committee of the City Corporation. Thus Southmead Hospital and its forerunners cover an unbroken period of nearly 250 years. St. Peter's Hospital was the first post-reformation hospital founded in England.

The Prime Minister, with Mr. Menzies and Mr. Winant, outside the University—Easter Saturday, 1941.

H.R.H. the late Duke of Kent, with the Regional Commissioner, General Sir Hugh Elles.

His Majesty the King thanks the Matrons and Hospital Staffs.

many heavy calibre bombs fell within 50 yards of the buildings, blew in most of the windows and threw masses of mud and debris into the wards and rooms adjoining. Fortunately all the patients had previously been moved to the basement shelter before the electric current, water and gas supplies failed. The weather was bitterly cold at this time and the conditions prevailing inside the Hospital were dreadful, but the staff gallantly carried on and saw to the safe evacuation of the patients. Weeks elapsed before temporary repairs could be effected to allow the wards to be used again, but the casualty and out-patient services were not interrupted.

No sooner had the Hospital commenced to function again when, during an intensive raid in January, a serious fire occurred through quantities of incendiary bombs, 16 in one tray, falling on the roof. The staff and members of the Auxiliary Fire Service stationed at the Hospital were unable to deal with this before the night nurses' and the maids' quarters on the top floor were furiously blazing. The fire rapidly spread to the tower, the dome of which was destroyed, together with the contents of the night nurses' and the maids' rooms and three wards below. At the same time high explosive bombs were dropped close at hand and the blast from these caused still more damage. There was a good supply of water available, pumped from the dock by motor pumps, and it was solely due to this that the Hospital was saved from complete destruction.

The conditions prevailing in the Hospital during the fire and for some time afterwards were well-nigh beyond description. Water and filth cascaded down staircases, lift-shafts and air ducts and through ceilings. Water was everywhere.

The staff was wonderful, and stood bravely up to the difficulties and dangers. The Matron, Miss A. C. Robins, has since been awarded the O.B.E. for the noble example she set to her staff throughout. Naturally it took some time to recover from this onslaught in the damp and sour atmosphere which prevailed, but all stuck to it in spite of the absence of electricity or gas for days.

An underground operating theatre unit was provided later, where the surgeons worked in comparative safety, with wards adjoining for air-raid casualties. This accommodation proved of inestimable value during subsequent air raids and enabled the Hospital to carry on its work despite the damage it had sustained.

The Children's Hospital received extensive damage as the result of a stick of bombs falling across the building, the out-patient department, and the Nurses' Home. One very large bomb fell in the garden, tore off the tiles, broke down the doors, and smashed nearly all the glass in the windows. The electric light was extinguished, as were the emergency lights, the night lights and hurricane lamps, plunging the whole building in total darkness. In the midst of all this damage, with the plaster falling from the ceilings and the crashing of falling masonry all the patients were evacuated without a single casualty and taken to another Hospital.

The corridors were a mass of broken glass, plaster and debris, over which the children had to be carried, while bombs constantly exploded nearby. Many times both nurse and patient had to lie on the ground

to avoid blast, the nurse covering the child with her body. All this was done in complete darkness. The behaviour of the Matron, Miss G. R. Ellis, and nurses was beyond all praise, and they have been presented with a framed appreciation by the Lord Mayor on behalf of the Committee.

The next day about thirty soldiers were sent to the Hospital to help clear away the tremendous quantity of debris, which included not only broken masonry but an immense quantity of soil and clay thrown up by the explosion. These men worked for days in an endeavour to get the wards, corridors and out-patient departments free of rubbish. In addition, the City Engineer sent a large number of workmen to undertake first-aid repairs to the building. The damage was so extensive that it took nearly three months to get the Hospital into a condition to receive patients. The out-patient department was so damaged by a direct hit, that it has been abandoned for this purpose.

The Nurses' Home also received a direct hit, the bomb falling into a 500-gallon water tank under the roof. This tank, which is one of several, was destroyed, but it caused the explosion to be upward, tearing off the tiles, smashing windows and tearing off the plaster. It was simply miraculous that with all this destruction there were no casualties. It seemed hopeless to get the Hospital into order again, but by the united efforts of the City, soldiers and the staff themselves this was achieved, and the Bristol Children's Hospital resumed its work of treating boys and girls who were ill.

The Southmead Hospital escaped heavy damage by near misses of bombs. A parachute with a basket of incendiaries was sighted in its descent. By skilful operation of the staff, the threatened conflagration was averted and the parachute salvaged intact as a souvenir. The fabric was of white artificial silk, beautifully made, with its markings of German manufacture, cords, loops and rings all intact. In one raid high explosives fell. One was in close proximity to Dr. Phillips' residence, where groups of nurses were taking shelter. The sub-soil of the site is soft clay to a considerable depth. The bomb penetrated deeply and its explosion raised a huge blister or mould of unbroken turf. The clay, acting as a cushion, had absorbed the shock, disrupting the underground cables and pipes with no damage to the adjacent building or injury to the staff.

The reception of air-raid casualties was spread over 25 days and nights following the visits of the enemy over a period of six months. The casualties admitted were 410, the highest number on one day being 81. A wonderful spirit and great fortitude prevailed amongst all the patients, as in all the Hospitals. Sallies of humour often brightened the wards as the patients gained strength in body and spirit. The Lord Mayor and Lady Mayoress, accompanied by Mr. C. H. W. Davey (the Sheriff of Bristol) and Mrs. Davey, on one occasion were greeting a young man of 20 years very ill with chest and ankle injuries. He brought smiles to all when he said chirpily to the Lady Mayoress, "I like your hat." Then the child from Australia, who declared he came from "down under," focussed the amused attention of the group around his cot upon the Lord Mayor whose name had been thus inverted. This brave little fellow had lost his father in

Australia and his mother and grandmother were slain by the Nazis at Avonmouth. Now resident in Edinburgh, he writes regularly to his Ward Sister.

A young married couple had each lost a leg, amputated, but they were jolly and bright about it all. During their convalescence they playfully teased each other and laughed over the length of stump each had left.

A father and mother in separate wards had their five children, aged 4, 6, 8, 10 and 12, in an adjacent ward. They were a remarkable family and shed happiness around them. The four elder children sang solos and a chorus to the Lord Mayor. Their name was Plenty, an appropriate epithet where there was such an abundance of mutual love and happiness shown between parents and children.

At another visit two married ladies, sisters, in adjacent cots, greeted the Lord Mayor with charming smiles to reveal to him they were his former pupils. Fortunately the press photographer was awaiting his opportunity, so the cots were placed together and the Lord Mayor sat upon the bedside renewing old acquaintances whilst the camera recorded the re-union. These incidents may each appear to be trivial, but amidst the scenes in the Hospital such bright patches were turned to the best psychological use, as the hand-maiden to skilful surgery, under the inspiring leadership of Dr. Phillips and Miss E. Webber the Matron.

Attached to this Hospital is a Blood Transfusion Unit. Many lives were saved by this system. Altogether 530 pints of blood were transferred to 204 casualties in Bristol Hospitals. Of these, 227 pints of blood were used in Southmead Hospital for 82 patients. It is estimated that from 120 to 150 Bristol lives were saved through the operation of blood transfusion.

At the Cossham Memorial Hospital over 100 casualties were admitted from seven air raids and a large number of out-patients were also treated. The devotion to duty and the courage of the nursing personnel was an inspiration on all occasions. The patients displayed great fortitude, those less seriously injured cheering and helping their comrades. The injured from a particular factory were magnificent in spite of terrible injuries and burns and they literally would not take their plight seriously. One remarkable little patient was a child aged two-and-a-half years. Both her parents had been killed and she quickly became the mascot of the Hospital. On many occasions she was seen in the City escorted and being treated to tea by a member of the nursing staff off duty. The seriousness of her injuries was belied by the cheery piping voice and the sunny smile.

The Bristol Royal Infirmary received heavy air-raid damage; on different occasions windows and frames were blown away, steam mains, lifts and the lighting and power systems were put out of action, the mortuary, the mortuary chapel with its beautiful stained-glass windows, the Calorifier House machinery, the out-patients department, the pathological, fracture and massage departments were all seriously damaged with their valuable contents. High explosives caused the evacuation of the Nurses' Home. The estimated cost of the damage exceeded £20,000, yet the Hospital functioned effectively and the staff bravely carried on amidst the dangers and under the grave handicaps

to their life-saving work. About 500 casualties were admitted and well over that number of out-patients were dealt with. In addition, patients were received from the Eye Hospital which was evacuated when threatened by surrounding fires ; 50 more patients were admitted from the General Hospital when that was hit.

To provide for possible contingencies many patients were evacuated to the Royal West of England Sanatorium at Weston-super-Mare, the Birmingham Hospital Saturday Fund Home at Kewstoke, and Eastern House School. Distributions of fracture and other patients were made to St. Martin's Hospital at Bath, and to the Winford Orthopædic Hospital at Winford. St. Monica's Home gave up half their number of beds to replace those lost by the Bristol Royal Infirmary. In those evacuations ambulance drivers, voluntary drivers and owners of private cars gave splendid service.

In the absence of power one night the lifts were manned by volunteers until 3 a.m., when the Army Traffic Control arrived and took over the work of the already tired stretcher bearers. The staff worked by candle and torch light during one raid when all lights were fused. They were themselves fortified in their courage by the example of Auxiliary Fire Service men who came in as many as six times for dressings and went back to duty although their hands were badly burned.

In the later months of this tragic period America sent large quantities of clothing which was used for re-fitting families. Supplies of surgical instruments and other gifts from America replaced much of the destroyed equipment.

The Bristol Hospitals which received casualties were visited by the Lord Mayor and Lady Mayoress a few days after each blitz. They stood by the bedside of over 1,000 citizens in their 36 visits to these Hospitals and whenever possible gave to each one a message of comfort and cheer, expressing the admiration of their fellow citizens for the courage the patients had displayed as casualties in the front line of the battle for liberty. Never was there one word of complaint from those brave men, women and children ; from their lips and their hearts came words of loving gratitude for the wonderful deeds of bravery, kindness and skill shown them in the time of their suffering. The Lord Mayor publicly testified on many occasions how deeply he had been affected by those bedside talks and how highly he appreciated the magnificent skill and integrity shown by all members of the Hospital Staffs in this City.

Reviews of Books

Medical Annual, 1942. Edited by H. LETHEBY TIDY, D.M., F.R.C.P., and A. Rendle Short, M.D., F.R.C.S. Pp. lii., 396. Bristol: John Wright & Sons Ltd. Price 25s.—In spite of great difficulties the publishers have brought out their sixtieth volume in its usual form and with its usual content of up-to-date and stimulating information. In medicine one of the most interesting articles is that dealing with *Mass Radiology of the Chest*. The technique of the procedure is fully discussed and its value judiciously appraised. Modern views on *Blast injuries of the lung* are briefly but adequately summarized. On *Leishmaniasis* there is a useful reminder that the disease is more widely spread in Europe than is generally known, and is a common infection amongst dogs. The part played by the sandfly in transmission is emphasized. Treatment is well described. In the section on *War Psychiatry* the value of psychiatric examination of potential recruits and the assessment of their mental fitness are excellently dealt with. Much attention is given to *Scabies*, a disease which commonly increases in prevalence during wars. The article on *Burns of War* is particularly timely, though the description of the treatment of phosphorus burns is quite inadequate. *Diseases of the Cornea* contains some observations on the value of ascorbic acid in the treatment of corneal ulceration and superficial keratitis. The war-time increase in *Peptic Ulcers* renders the two articles on their medical and surgical interest exceptionally important. But there is something important and interesting in the *Medical Annual* for every variety of practitioner. Its quality and popularity continue undiminished.

Materia Medica for Nurses. By A. MUIR CRAWFORD, M.D., F.R.F.P.S.G. Fifth edition. Pp. viii., 138. London: H. K. Lewis & Co. Ltd. 1942.—That this book has reached a fifth edition in less than fifteen years since its first appearance shows that it is appreciated. This edition contains two new chapters, one on the Sulphonamide Group of Drugs and one on the D.D.A. and the Pharmacy and Poisons Act. The sections on General Anæsthetics, Hypnotics, Vitamins and Substances obtained from the Animal Kingdom have been enlarged. In the last-named chapter it is surprising to find no mention of protamine insulin without zinc, now usually called "Delay" insulin. In the vitamin section Riboflavin escapes mention, but these are unimportant omissions in a book for nurses, who will find it a readable and interesting source of instruction on drugs and their uses.

Clinical Practice in Infectious Diseases. By E. H. R. HARRIES, M.D., M.R.C.P., D.P.H., and M. MITMAN, M.D., M.R.C.P., D.P.H., D.M.R.E. Pp. xii., 468. Illustrated. Edinburgh: E. & S. Livingstone. 1940. Price 17s. 6d.—Within its 456 pages, this book gives an excellent, up-to-date account of the infectious diseases of this country including prophylaxis. A novel but logical feature is the grouping of the

hæmolytic streptococcal diseases, scarlet fever, erysipelas, etc., into one group. Another useful section is that dealing with the control of infectious diseases in hospital. The student and practitioner will find all he needs for modern methods of diagnosis and treatment in this volume. Owing to the large amount of facts compressed into a small compass, the style of the book is very impersonal and makes rather arid reading.

Lectures on Conditioned Reflexes. Vol. 2.—Conditioned Reflexes and Psychiatry. By I. P. PAVLOV. Translated and edited by W. H. GRANT, M.D., B.Sc. Pp. 200. Illustrated. London: Lawrence & Wishart Ltd. 1941. Price 8s. 6d.—Any paper from the Pavlov School of Physiology is worthy of attention and the present collection under review makes first-class reading. The range of subjects covered is very wide and includes many of contemporary psychiatric interest. Especially interesting is the chapter on the physiological explanation of hysteria, which is very relevant to war conditions. The translation is good and the book excellently printed. Altogether this book can be confidently recommended to anyone who appreciates the philosophic aspects of medicine, and who wishes to obtain an excellent grasp of contemporary neuro-physiology.

Mule Spinners' Cancer. First Edition. By E. M. BROCKBANK, M.B.E., M.D., F.R.C.P. Pp. 36. Illustrated. London: H. K. Lewis & Co. Ltd. 1942. Price 4s.—This little book, of thirty-six pages, gives a most interesting account of the disease, which has been recognized for about thirty-five years. Illustrations are given of the men at work, showing plainly why the left side of the scrotum is much more often affected than the right. The disease is not seen until the man has worked in the mills for at least ten years; there is usually some pre-cancerous condition of the skin such as papilloma or keratosis. It is due, of course, to the mineral lubricating oil used for the machine. Precautions recommended are a medical examination every six months, with excision of pre-cancerous patches; use of a less dangerous lubricating oil, and the application of a protective ointment.

Surgery of Modern Warfare. Part I. Edited by HAMILTON BAILEY, F.R.C.S. Pp. iv., 160. Illustrated. Edinburgh: E. & S. Livingstone. 1940. Price 12s. 6d.—This publication will be of great use to all who have to tackle the surgical problems of the present day. The many eminent contributors present the multiple phases of these problems with great clarity and maintain throughout an essentially practical approach. A particularly useful chapter is that on "Local Treatment of Infected War Wounds"; these are cases in which routine excision must not be carried out, and the amount of necessary interference is precisely outlined in tabular form. Another chapter deals clearly with all that is involved in excision of a fresh wound. The illustrations throughout are good, and the coloured plates are of particular excellence. As an up-to-date guide to treatment of air-raid casualties and of casualties in the forces this publication will be hard to excel, and we shall await the second part with more than ordinary interest; it is due to be published almost immediately.

Editorial Notes

Return of Colonel Clarke.

THE return of Colonel R. C. Clarke to civil life and practice is a matter of great satisfaction to his colleagues.

His military career dates back to 1903 when he joined the Bristol Rifles as a private. He received his commission as combatant officer in the old volunteer force and in 1908 became a territorial. After obtaining his medical qualification, he joined the R.A.M.C. and served for many years as Regimental Medical Officer to the 4th Gloucesters, with whom he went to France in 1915 with the other units of the 48th South Midland Division.

After a period of service as Regimental Medical Officer he joined No. 19 C.C.S., where he was in charge of the medical wards.

For his outstanding services in the last war he received the O.B.E., military division.

At the outbreak of war in 1939 he was still on the active list of the Territorial Army with the rank of Colonel. After a period of service at home, he proceeded to the Middle East in command of a General Hospital. A troublesome illness whilst abroad automatically deprived him of his command, and he returned to England. On his arrival in England, although completely restored to health, the War Office decided to place him on the retired list. Since he appears to be in command of excellent health and his vigour is undiminished, his value in civil practice and in the hospital work of Bristol cannot be over estimated.

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Royal Naval Hospital.

AN interesting series of demonstrations and lectures was arranged at the Royal Naval Auxiliary Hospital for the winter months. They were held in the Recreation Hut every fortnight on Fridays at 4.30 p.m. Members of the Bristol Medico-Chirurgical Society were invited to attend.

The programme was as follows: 4th December, Surgeon-Captain Macdonald Critchley, R.N.V.R.: "Medical Aspects of Shipwreck." 18th December, Clinical Meeting: Demonstration of cases.

1st January, Surgeon-Commander J. Green, R.N.V.R. : " Bacteriological Aspects of Acute and Sub-Acute Rheumatism " (title and date to be confirmed). 15th January, Clinical Meeting : Demonstration of cases. 29th January, Surgeon-Captain Lambert Rogers, R.N.V.R. : " Head Injuries." 12th February, Clinical Meeting : Demonstration of cases. 26th February, Surgeon-Captain Desmond Curran, R.N.V.R. : " Depressions."

These clinical afternoons have been very greatly appreciated. Our Naval colleagues have made themselves an integral part of the Medical life of Bristol.

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Anæsthesia for Shocked Patients.

IN our Spring, 1942, issue a discussion on " Anæsthetics " was reported ; but there was little mention made of the special difficulties which attend the anæsthetization of shocked patients. The Ministry of Health has just issued an " instruction " prepared by a sub-committee of the Medical Research Council and the Consultant Adviser in Anæsthetics. It appears to be of great importance to all medical officers who may be called upon to give anæsthetics in an emergency. In the first instance, naturally an experienced anæsthetist would, if possible, be sought for when a shocked patient is to be operated on. This will often be impossible, and the following principles are laid down to help the less experienced anæsthetist :—

1. Do not start giving an anæsthetic unless the main anti-shock measures have already been started. Sometimes this is the duty of the anæsthetist, but in any case he should satisfy himself that the patient is being kept warm, that the intravenous infusion is worked satisfactorily, that movement of the patient is minimal, slow and gentle. He must know whether morphine has been given. He must see that whenever possible the patient's head is at shoulder level or lower.

2. The occasional anæsthetist should use the agent and method with which he is most familiar.

3. Anæsthesia for shocked patients is easily induced, and overdosage is the common fault of the inexperienced. Shocked patients require far smaller quantities of any anæsthetic than the normal patient.

4. Oxygen is all important for these patients. An entirely unobstructed air-way must be maintained throughout, and additional oxygen is usually desirable.

Most general anæsthetics, while well tolerated in fit patients, are dangerous in patients gravely ill from shock, hæmorrhage or sepsis. The following considerations apply to such patients :—

Ether.—Ether anæsthesia may cause grave deterioration in the general condition of a shocked patient. Minimal quantities may be

permissible to reinforce nitrous oxide and oxygen where the latter has proved inadequate. If nitrous oxide and oxygen are not available ether may have to be used alone. If so, the open method or Clover's inhaler are held to be undesirable and some apparatus such as the Oxford Vapouriser is advised. (If this is not available we presume Boyle's or Shipway's apparatus might be permitted.—Editor.)

Chloroform.—In the hands of an expert, chloroform may be satisfactory, but the sub-committee does not advise its general use. (This limited approval of chloroform is interesting.—Editor.)

Vinyl Ether.—Experience of this anæsthetic in shocked patients is small and the drug is in very short supply. The sub-committee thinks that perhaps vinyl ether, or a mixture of vinyl with ethyl ether may prove useful, either alone or combined with nitrous oxide and oxygen. (In any case the inexperienced anæsthetist is not likely to be called upon to use vinyl ether.—Editor.)

Trichlorethylene.—The sub-committee draws attention to the possibilities of trichlorethylene as an analgesic and anæsthetic in cases of shock and advises an early investigation of its qualities.

Cyclopropane.—This drug is in short supply and should not be used by the inexperienced except under expert supervision, and then probably only in special units. It has little deleterious effect on shocked patients. The high proportion of oxygen that can be used renders it specially suitable for patients suffering from severe anæmia, chest injuries, or respiratory embarrassment due to irritant gases.

Nitrous Oxide.—This should be used with oxygen, and provided anoxia is avoided does not appear to harm the shocked patient. Its range may be extended by the use of local anæsthesia. To the basal level of anæsthesia from nitrous oxide and oxygen may be added various adjuvants, of which the most suitable are ether, cyclopropane, pentothal or evipan. The sub-committee regard this method (with suitable apparatus such as is provided at all E.M.S. and many other hospitals) as the most appropriate for general adoption, and for the general instruction of learner-anæsthetists.

Barbiturates.—The sub-committee regards the short acting barbiturates (such as pentothal) as suitable for use on shock patients. These drugs, however, may easily prove lethal in careless or inexperienced hands. The dose needed is much reduced in shock or anæmic patients. The portability and simplicity of apparatus required renders the barbiturates especially suitable for use at dressing stations or field hospitals.

Local Analgesia.—The sub-committee is somewhat pessimistic on this subject. Further enquiry is necessary before the value of local analgesia can be judged. It must be shown to possess definite advantages before its general use could be recommended. There are considerable difficulties in the way of training an adequate number of anæsthetists in its use.

Spinal Anæsthesia should not be used where shock has supervened.

A few further notes are added to the sub-committee's recommendations by the Consultant Adviser in Anæsthetics.

Morphine.—Dosage for pain relief is frequently excessive in view of the patient's condition. Respiratory depression may prove dangerous during induction and maintenance of, as well as recovery from the anæsthetic. Allowance must be made for delayed absorption when the circulation is impaired. When a further dose of morphine is considered necessary, prior to induction of anæsthesia, it is best given slowly by intravenous injection and indilute solution.

Carbon Dioxide.—Persistent efforts to stimulate depressed respiration in shocked patients by CO_2 are more likely to do harm than good.

Movement of Patients after Operation.—The importance of slow and gentle movement of the patient from operating-table to bed should be impressed on nurses and orderlies.

Oxygen Therapy.—When immediate post-operative oxygen therapy is indicated, oxygen administration should begin on the operating-table and be continued during transfer to the ward.

It is interesting to compare the views expressed by Pender and Lundy in *War Medicine* (1942, 2, 193).

These authors, reviewing the topic of Anæsthesia in War Surgery, make the following predictions :—

1. Chloroform will be the reserve anæsthetic agent for use under adverse circumstances.

2. Ether will be the foundation anæsthetic agent when other agents are unsatisfactory.

3. Local anæsthesia will either be used alone or supplemented whenever possible.

4. Nitrous oxide and oxygen will be most useful for simple induction and for short operations.

5. Spinal anæsthesia administered by experienced hands will be safer than ever before for operations performed below the diaphragm.

6. Quick-acting barbiturates administered intravenously will be used more often than any other type of anæsthetic agent.

7. Rectal anæsthesia will seldom be used.

8. Cyclopropane will be unequalled for anæsthetizing many patients in base hospitals.

9. The intratracheal method will be almost the routine manner of administration of the volatile anæsthetic agents.

Obituary

EDWARD FAWCETT, M.D. (Edin.), F.R.S.

On September 21st, Professor Fawcett, who for forty-one years held the Chair of Anatomy in the University College, and University of Bristol, died suddenly while walking in the street. He had occupied a pre-eminent place in the work of the University and in the affections of many generations of medical students. He came to Bristol as a young man in 1893, four years after he had qualified at Edinburgh University, to be the first full-time Professor of Anatomy in University College, and he captured the attention of a none too orderly crowd of medical students immediately by his capacity to lecture, to demonstrate, to illustrate by drawings and by his power of keeping order. Perhaps he had other gifts besides his grasp of anatomy that gave him authority in his class-room. He was an all-round athlete, and as a cricketer might have found a place in almost any county team. Edward Fawcett was born in 1867, the son of Thomas Fawcett, B.A., at Blencow, near Penrith, and was educated at the Grammar School there and at Edinburgh University. By 1887 he had become a demonstrator of Anatomy in the Edinburgh School of Medicine and after he graduated in 1889 he was demonstrator of anatomy at Yorkshire College, Leeds, till he was called to Bristol. In 1906 he became Dean of the Faculty of Medicine and he played an important part in organizing the Faculty when the University was given its charter three years later. The Vice-Chancellor (Dr. T. Loveday) writes the following appreciation and tribute: "As a colleague in administration Edward Fawcett was of a metal that always rang true. He had his prejudices, as who has not? But he recognized them as such and allowed for them himself, so that his view of a problem was objective, fair and generous. His opinions were well considered and fortified by long experience accurately remembered. They were clear-cut and he expressed them forcibly, though never clamourously; if, rarely, they were not accepted, he co-operated with full energy in the policy adopted. He was entirely loyal to the University which he served, always helpful, always dependable. He was upright-fashioned and four-square, solid, strong and firm." For he was able and diligent in his attention to affairs. Academic honours naturally came to him, and in 1906 he won the gold medal for his M.D. thesis at Edinburgh. In 1909 he was made President of the Anatomical

Section of the International Congress of Medicine at Budapest, and from 1927 to 1929 he also held that office in the Anatomical Society.

Fawcett's researches into the development of the human skeleton and of the mammalian chrondrocranium won for him the F.R.S. in 1923, but the beautiful wax models which illustrated his work have been lost by enemy action. Apart from his prowess at cricket Fawcett had many hobbies. He was an indefatigable cyclist and used his bicycle on many expeditions to study church architecture. He was a first-rate photographer, and some of his best work illustrated his Presidential Address to the Bristol and Gloucestershire Archæological Society in 1936, when he spoke on anthropophagous sculpture and royal arms in churches. For many years he represented Bristol on the Central Council for the Preservation of Churches, and for the past months he had been re-photographing local churches for the National collection. Prehistory was another of his recreations, and he was energetic in his support of the University Spelæological Society, of which he was for many years President, and he was the enthusiastic comrade of the youngest undergraduates on expeditions to explore the caves of the Mendips.

Professor Fawcett married, in 1895, Edith Dora Wordsworth, and he leaves her with a daughter and a son, A. W. Fawcett, surgeon to the Sheffield Royal Infirmary.

CHARLES ARTHUR WIGAN, M.D. (Dur.), M.R.C.S., L.R.C.P.

DR. WIGAN, for many years a member of this Society, passed away at the ripe age of 86 at Portishead, where he had practised for fifty years.

The son of Dr. George Wigan, he was born in Australia, but went with his parents to Portishead when he was seven years of age.

He received his medical education at Durham University and Charing Cross Hospital, taking the diplomas of L.S.A. in 1881 and M.R.C.S. in 1882. He obtained the M.B. degree at Durham in 1883 and proceeded to the M.D. in 1888. After holding several resident appointments at Charing Cross he settled to practice at Portishead. Dr. Wigan had rendered much service to the town in addition to his medical work.

He was a member of the original Portishead Urban Council, which was appointed in 1892, and was the last surviving original member.

For twenty-three years he served on the Council, and was Chairman for eighteen of those years.

Dr. Wigan was a Justice of the Peace for Somerset.

For some years he was a member of St. Vincent Lodge of Freemasons in Bristol.

ELIAS GEORGE HALL, M.B. (Lond.), M.B., Ch.B. (Brist.), M.R.C.S., L.R.C.P.

WE regret to record the death of Dr. E. G. Hall which took place on Wednesday, November 18th, at the age of 75.

Dr. Hall was one of our senior Bristol alumni. He entered University College in 1885 and attended the clinical practice of the Bristol Royal Infirmary. He qualified M.R.C.S., L.R.C.P. in 1890 and took the London M.B. degree in 1893. In 1912 he obtained the M.B., Ch.B. degree by examination in the University of Bristol under the regulations laid down for old students of University College.

Dr. Hall held the resident appointment of Junior House Surgeon and Anæsthetist at the B.R.I. When he left the B.R.I. he was appointed to the Bristol Dispensary and worked there for many years. He was also out-patient physician to the Royal Hospital for Women and Children. During the last war he worked as an R.A.M.C. (T.) officer at the Subsidiary War Hospital at the Red Maids' School. He was one of the prime movers in establishing the local volunteers during the last war: a body which corresponds in many ways with the Home Guard of the present war.

Dr. Hall came of a yeoman family in Somerset. He was born at Durdham Lodge, Stoke Bishop, now called The Little Halt. He married, in 1901, Ethel Mary Gilmore, of Barrow Hall, Essex, who survives him and to whom we offer our deep sympathy.

E. G. Hall was a family doctor of the finest type. Kind, sympathetic and unsparing of his own health and strength in the care of his patients.

The Medical Library of the University of Bristol

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The following donations have been received since the publication of the list in the last issue :—

Dr. J. S. Baxter (1)	1 volume.
Professor R. J. A. Berry (2)	1 volume.
The late Professor Fawcett (3)	2 volumes.

General Medical Council (4)	1 volume.
Messrs. Wm. Heinemann (Publishers) (5)	1 volume.
The Henry Phipps Institute (6)	1 volume.
Professor E. W. Hey Groves (7)	7 volumes.
Munro Smith Fund (8)	1 volume.
Professor J. A. Nixon (9)	1 volume.
Dr. G. S. Parkinson (10)	1 volume.
W. H. Ross Foundation (Scotland) (11)	1 volume.
J. E. Shaw Bequest (12)	2 volumes.
Smithsonian Institute (13)	1 volume.
Messrs. John Wright & Sons Ltd. (14)	4 volumes.

Unbound periodicals have also been received from Dr. S. B. Adams, Dr. R. F. Barbour, Professor E. W. Hey Groves, Dr. T. Milling, Professor C. Bruce Perry, Dr. J. Odery Symes, Messrs. John Wright & Sons Ltd.

THE ONE HUNDRED AND SEVENTY-SIXTH LIST OF BOOKS.

The figures in round brackets refer to the figures after the names of the donors. The books to which no such figures have been attached have either been bought from the Library Fund or received through the *Journal*.

Album XVI. International Medical Congress		(3)	1909
Bailey, Hamilton (Ed.)	*Pye's Surgical Handicraft* 13th Ed.	(7)	1942
Bailey, Hamilton	*Demonstrations of Physical Signs in Clinical Surgery* 8th Ed.	(7)	1942
Bailey, Hamilton	*Surgery of Modern Warfare.* Vol. I. 2nd Ed.	(7)	1942
	Surgery of Modern Warfare. Vo. II. 2nd Ed.		1942
Baxter, Dr. J. S.	*Aids to Surgical Anatomy* 2nd Ed.	(1)	1942
Berkeley, A. Comyns	*Handbook of Midwifery* 11th Ed.		1941
Berry, R. J. A.	*Your Brain and its Story*	(2)	1939
Bertwistle, A. P.	*Descriptive Atlas of Radiographs* 5th Ed.	(14)	1942
Bramwell, C., and King, J. T.	*Principles and Practice of Cardiology*		1942
British Encyclopædia of Medical Practice—			
	Surveys and Abstracts		1941–2
	Cumulative Supplement	(12)	1941–2
British Pharmacopœia, 1932—			
	Second Addendum		1940
	Fourth Addendum		1941
Brockbank, E. M.	*Mule Spinners' Cancer*		1941

Clay, H. H. .. .. .. *Sanitary Inspectors' Handbook* .. 5th Ed. 1942

Conybeare, J. J. .. .. *Textbook of Medicine* 1942

Davies, H. M., and Coope, R. (Eds.) *War Injuries of the Chest* .. (14) 1942

Dilling, W. J., and Hallam, S. *Dental Materia Medica* .. 2nd Ed. 1941

Gruner, O. C. .. .. .. *A Study of the Blood in Cancer* .. .. (14) 1942

Harries, E. H. R., and Mitman, M. *Clinical Practice in Infectious Diseases* 1940

Hunter, W. .. .. .. *Human Gravid Uterus.* (Sydenham Society).. 1851

Jameson, W. W., and Parkinson, G. S. *Synopsis of Hygiene* .. 7th Ed. (10) 1942

Key, J. A., and Conwell, H. E. *The Management of Fractures, Dislocations and Sprains* .. .. .. 3rd Ed. (7) 1942

Lewis's Library Catalogue. Supplement, 1938–41 1942

Linell, E. A. .. .. .. *Distribution of Nerves in the Upper Limb* (3) 1920

Macleod, J. J. R. .. .. *Physiology in Modern Medicine* 9th Ed. (8) 1942

Maximow, A. A., and Bloom, W. *Textbook of Histology* .. .. 4th Ed. 1942

Mayo, Katherine .. .. Volume II. .. .. (9) 1931

McMeeken, M. .. .. .. *Developmental Aphasia in Educationally Retarded Children.* [W. H. Ross Foundation (Scotland)] .. .. (11) 1942

Medical Research Council. Special Report Series, 243. *Chronic Pulmonary Disease in South Wales Coalminers.*

Medical Research Council. Special Report Series, 245. *Report of the Committee on Bed-bug Infestation* 1935–40

Middlesex Hospital .. .. *Collected Papers in Physiology and Medicine* (7) 1941

Pavlov, I. P. .. .. .. *Conditioned Reflexes.* Vol. II. 1941

Piney, A. .. .. *Synopsis of Blood Diseases* .. .. (5) 1942

Scott, S. G. .. .. .. *Monograph on Adolescent Spondylitis* 1942

Sherman, H. C. .. .. *Chemistry of Food and Nutrition* 6th Ed. 1941

Sigerist, H. E. .. .. .. *Man and Medicine* 1932

Thompson, C. J. S. .. *History of Surgical Instruments* .. .. .. (7)

Wallace, A. B. .. .. *The Treatment of Burns* 1941

TRANSACTIONS, REPORTS, JOURNALS, ETC.

Annual Report of the Smithsonian Institute .. .. (13) 1940–41

Henry Phipps Institute (University of Pennsylvania, 29th Report (6) 1940–41

The Medical Annual 1942

The Medical Register .. .. (4) 1942

Quarterly Cumulative Index Medicus. Vol. 30. July—December 1941

Publications Received

From Messrs. H. K. Lewis & Co. Ltd.:

Catalogue of Lewis's Medical and Scientific Lending Library. Supplement, 1938–41. Price 4s.

Instructions for Measuring Insulin. By S. L. Simpson. Price 8d. per card.

From Oxford University Press:

Cancer of the Uterus. By Elizabeth Hurdon. Price 17s. 6d.

Oxford War Manual: Amputations and Artificial Limbs. By R. D. Langdale-Kelham, M.R.C.S., L.R.C.P., and George Perkins, *M.C.*, F.R.C.S. Price 5s.

From John Wright & Sons Ltd.:

British Journal of Surgery. No. 117. Vol. 30. Price 12s. 6d.

Pye's Surgical Handicraft. 13th Edition. Edited by Hamilton Bailey, F.R.C.S. Price 25s.

Tuberculosis in Childhood. By Dorothy S. Price. Price 17s. 6d.

Local Medical Notes

Two students of the University have been elected to Rockefeller Medical Studentships:—

Susanna Foss, at University of Chicago.
Grace V. Andrew, at Tulane University.

EXAMINATION RESULTS.

University of Bristol.—Students of the University have recently passed the following examinations:—

M.B., Ch.B.—*First Examination.* Margaret J. Andrews, L. W. J. Clarke, W. L. Codd, G. J. S. Herdman, Una P. Jones, Mary Knowles, G. E. Mitchelmore, Jean E. Morrell, J. P. Norris, S. M. Stotesbury, Sybil M. Tuffin. *In Biology:* F. G. Bolton.† *In Physics and Organic Chemistry:* D. H. Drummond.† *Supplementary First Examination:* Endora M. R. Davies, C. E. Halliday, Lisa E. Mandelbaum, P. J. D. Benjafield, D. M. Cunningham, G. Edwards, M. E. Hincks, Catherine M. Hoyle, Jean Musgrave, J. S. R. R. Old, F. A. A. Ruggeri.

M.B., Ch.B.—*Second Examination.* M. Alms, Grace V. Andrew, J. B. Brierley, Elizabeth Bryant, N. J. Cook, R. W. Drewer, J. L. Dunscombe, A. C. Edwards, J. G. R. Ellis, E. W. Emery, Lorna M.

Green, Irene D. R. Gregory, J. R. Hawkings, D. H. Johnson, Margaret A. Lamb, Edith J. Lowick, Margaret M. Moncrieff, R. A. J. Pearce, Dorothy M. Reece, Patricia M. Rundle, R. H. Scott, Barbara F. Smith, S. A. K. Stokes, T. Straton, Edith E. Thomson, A. D. Verniquet, W. Wagland, Pamela Westhead. *Group I only:* P. J. Chapman, Margaret J. Cox, Pamela M. Farmer, Sheila E. Fraser, D. Purnell, A. D. Stewart. *Group II:* J. D. Medhurst,† A. D. Stewart.†

M.B., CH.B.—*Final Examination (Section I):* Janet Baker, J. E. Beviss, J. H. Challenger, A. G. M. Davies, C. H. Gurd, Mercia J. Griffiths, Beryl M. Hinckley, Elizabeth Hodson, J. E. G. Hope-Scott, W. G. H. Hunt, D. E. Olliff, A. P. Radford, Rukmini L. Reddy, D. A. Sarsfield, Margaret Savile, A. J. F. Saxton, S. S. Short, T. R. Stephens, I. F. R. Sutherland.

M.B., CH.B.—*Final Examination.* Nancy R. Baldwin (1), R. F. Brooks, J. H. Challenger, Rosalie M. Child, D. G. Davies, J. Deighton, Mary D. Dixon, G. F. M. Hall, Joyce Kennard, (Mrs.) J. Kerr, A. G. H. Mitchinson (2), E. W. Moore, J. L. Pardoe, A. F. Rogers, A. R. Rowe, (Mrs). M. E. Seddon, (Mrs.) M. Shanks, N. Slade, I. F. R. Sutherland, M. H. Thomas, G. H. Valentine (3), Jean Wallace, G. A. Walton, G. H. Wattley (2, 4). *Group I only:* W. G. H. Hunt. *Group II:* K. L. Brown†, A. H. M. Oakes,† (Mrs.) D. Willoughby.

B.D.S.—*First Examination.* E. J. R. Morgan, W. Watson. *In Chemistry and Physics:* P. J. Sheldrick.

B.D.S.—*Supplementary First Examination.* P. J. Blyth.

B.D.S.—*Second Examination.* G. A. J. Comyn, A. N. R. Gibson, D. C. Sara, A. F. J. Smith.

B.D.S.—*Third Examination.* H. L. Leech, E. M. Pitt (5), J. R. V. B. Gibson.*† *Dental Anatomy only:* J. M. Allen, I. A. Morgan.†

B.D.S.—*Final Examination.* F. M. Warren. *Section I. only:* C. R. W. Birkett, J. R. V. B. Gibson (6), R. D. Hepburn, J. B. K. Mann.

L.D.S.—*First Examination.* A. D. Baxter.

L.D.S.—*Supplementary First Examination.* R. D. Jefferies, A. H. Kingham, J. P. Rees, A. Thomas.

L.D.S.—*Second Examination.* T. W. Beer, K. W. Bowrey, M. P. Hazell, J. C. Nicholas, Eileen Rich, J. F. V. Woolley.

L.D.S.—*Third Examination.* T. W. Beer,* A. R. Brook,*† C. Gibbs, Alice B. U. Leigh,*† Eileen Rich, W. H. E. Turnbull.*† *Dental Anatomy only:* J. W. B. Kay,† N. W. Leech,† L. H. Valentine.

L.D.S.—*Final Examination. Section II (Dental Surgery):* W. D. Arnold,† Patricia M. Burke,† G. G. Davis,† G. Hellings,† D. A. Holmes,† I. E. Perry,† F. M. Warren.† *Section I:* W. E. C. Chaplin, H. B. Doubt, N. W. Leech, Alice B. U. Leigh, R. E. May, L. Murray, B. N. Neilson, B. A. Oliver, I. E. Perry, R. H. Shipway, R. C. Taylor, J. B. Westlake, J. B. Wood.

University of Cambridge.—M.B.—*Final Examination. Part I* (Surgery, Midwifery and Gynaecology): L. A. Scott White. *Part II* (Principles and Practice of Physic, Pathology and Pharmacology): (Mrs.) P. Eskell, D. S. Short.

Society of Apothecaries, London.—*Final Examination.* D. I. Fullerton (Midwifery),† A. F. Rogers (Obstetrics).†

Royal College of Surgeons of England.—*Primary Fellowship Examination.* J. B. Brierley.

Conjoint Board.—M.R.C.S., L.R.C.P.—*First Examination.* M. P. Bourke (7, 8), A. M. Brown (9, 10), Nina Dawson-Reid (9, 10), B. L. Finzel (7, 8), Sheila E. Fraser (10), G. A. K. M. Jahans (10), P. R. Miller (10), Phyllis D. Moses (7, 8), M. J. Mulcahy (10), Mildred I. Pott (7, 8), C. T. Ross (9, 10), A. D. Verniquet (9, 10).

M.R.C.S., L.R.C.P.—*Final Examination.* Margot H. Dickson (11), D. I. Fullerton† (12), F. J. Goddard† (12, 13), A. J. R. Hudson (11, 14), W. G. M. Hunt (11, 14), D. J. Jones (14), P. M. Keppich (14), A. F. Rogers (11, 12, 14), (Mrs.) M. Shanks (12), D. S. Short (11, 13), (Mrs.) D. M. Thorne (11, 12), G. H. Valentine† (14), E. L. Ward (14), G. H. Wattley† (14), J. I. Williams (12),† (Mrs.) D. Willoughby (13).

* In Dental Mechanics and the properties of materials used in Dental Practice.

† Completing the Examination.

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(2) With Distinction in Public Health.
(3) With Distinction in Obstetrics.
(4) With Distinction in Medicine.
(5) Distinction in Dental Anatomy.
(6) Distinction in Pathology.
(7) Pharmacology.
(8) Materia Medica.
(9) Anatomy.
(10) Physiology.
(11) Pathology.
(12) Midwifery.
(13) Medicine.
(14) Surgery.

As we go to press we learn with deep regret of the death of Emeritus Professor Francis Henry Edgeworth. An Obituary notice will appear in our next issue.

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